

# Pickwick Electric Uses Distribution Fault Anticipator to Detect and Locate Fault to Improve Service Reliability

## Success Story



“It can be a massive effort to track down a problem in a large service area when you don’t know where to start looking. The DFA’s monitoring capability alerted us to the fault and narrowed down the search area tremendously. With information from DFA, the job of tracking down a problem goes from something gargantuan to something manageable in a hurry. Most of the time now I’m aware of an impending problem prior to getting any customer calls.” —John Bowers, Operations Manager, Pickwick Electric Cooperative.

### The Challenge

Left undetected and untreated, small equipment problems on distribution circuits can escalate into full-blown failures, faults, and outages. Early detection of impending problems is very difficult, however, and even when a problem is identified, locating its source can be both labor-intensive and time-consuming.

At Pickwick Electric Cooperative, a TVA distributor committed to providing reliable and economical service, detecting and locating the sources of intermittent faults has been especially challenging. Intermittent faults cause a series of momentary interruptions from repeated recloser operations, and can eventually lead to outages and even transformer failures. Utilities may be unaware of these faults, and often the first indication of the problem comes from customers calling about dimming or blinking lights. Such complaints rarely provide information that’s helpful to locating and correcting the underlying source of the problem.

“It can be a massive effort to track down a problem in a large service area when you don’t know where to start looking,” says John Bowers, Operations Manager at Pickwick Electric. Like many other rural utilities, Pickwick has very long circuits with numerous branch points equipped with poletop reclosers and other protective devices. Locating an intermittent fault may require crews to make multiple visits to many far-flung recloser sites to determine which recloser is operating. The process can take days or weeks.

A faster, less labor-intensive approach to pinpointing impending problems would improve reliability, make more effective use of limited utility resources, and reduce operations and maintenance costs.

### The Solution

As a customer of TVA, Pickwick is one of 11 utilities field testing a prototype of the Distribution Fault Anticipator (DFA), a sophisticated online monitoring system. Developed by EPRI and Texas A&M University, the DFA uses advanced signal processing technology to detect and analyze the telltale precursor signals emitted by deteriorated or contaminated components. These precursor signals often exist long before a utility or its customers become aware that anything is wrong.

When a circuit at Pickwick's North Adamsville substation experienced faults two days apart, the DFA reported the faults and provided information suggesting they had the same underlying cause. Pickwick was otherwise unaware that the faults occurred, and no customers complained when the recloser momentarily interrupted service.

A two-man Pickwick crew used DFA information to narrow their search to a relatively small area and located the source of the problem in less than an hour. They found a dead squirrel near the base of a pole with a single-phase transformer. The transformer's primary bushing was burned. The squirrel apparently caused the first fault, which resulted in the burned bushing, which caused the second fault—and would have caused additional faults, additional damage, and a likely outage.

The DFA helped Pickwick locate the underlying problem much faster and more efficiently than traditional approaches. As a result, Pickwick avoided the consequences normally associated with intermittent faults and kept customers happy—no outages and no customer complaints.

“The DFA's monitoring capability alerted us to the fault and narrowed down the search area tremendously,” says Bowers. “With the DFA, we can see which feeder the fault occurred on, which phase it occurred on, which protective devices operated, the level of the fault current, the time it took to interrupt, and more. With that kind of information, the job of tracking down a problem goes from something gargantuan to something manageable in a hurry. Most of the time now I'm aware of an impending problem prior to getting any customer calls.”

### Applications

By improving situational awareness of distribution systems, DFA can help utilities better manage their physical and financial assets. DFA prototypes have demonstrated the ability to recognize precursors to a variety of failure mechanisms of line apparatus. Some examples documented to date include detection of a lightning arrester failing three days before actual failure, detection of tree contacts with lines, early detection of underground residential distribution cable failures, detection and recognition of multiple instances of failures on customer transformer secondary cables; detection of precursors of failures to line switches, and recognition of improper operation of a load tap changer controller and malfunctioning capacitor controllers.

### Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 ([askepri@epri.com](mailto:askepri@epri.com)).

### Technical Contact

Ashok Sundaram, 650.855.2304 ([asundara@epri.com](mailto:asundara@epri.com))

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#### Electric Power Research Institute

3420 Hillview Avenue, Palo Alto, California 94304 • PO Box 10412, Palo Alto, California 94303 USA  
800.313.3774 • 650.855.2121 • [askepri@epri.com](mailto:askepri@epri.com) • [www.epri.com](http://www.epri.com)